Implementing a Water Quality Monitoring Strategy: Challenges and Key Lessons

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Author Biography

Gary Kohlhepp received a B.S. degree in Biology from Xavier University in Cincinnati and a Masters degree in Aquatic Biology from the University of Notre Dame. From 1991-95, Mr. Kohlhepp worked on Lakewide Management Plans for the U.S. Environmental Protection Agency, Region 5 in Chicago. From 1996-99, Mr. Kohlhepp served on a detail to the Surface Water Quality Division, Michigan Department of Environmental Quality, which he joined permanently in November 1999. His primary responsibilities include: implementation and oversight of a comprehensive surface water quality monitoring program for the State; reporting on environmental indicators; and serving as a liaison between the MDEQ and other federal, state, local agencies with water quality monitoring responsibilities.

Abstract

In January 1997, the Michigan Department of Environmental Quality (DEQ) completed a comprehensive strategy for assessing water quality status and trends. Program areas include fish and wildlife contaminants, water, sediments, biological integrity, beaches, stream flow, and volunteer monitoring. In 1998, Michigan voters approved the Clean Michigan Initiative, a state bond which allocated additional funds for water quality monitoring. As a result, the DEQ monitoring budget increased by $3 million per year. The process of implementing a multitude of new and expanded projects, ensuring that these activities are integrated, and coordinating with federal, state, and local agencies has been a challenge. The DEQ has worked through a number of planning and logistical issues, such as balancing multiple monitoring goals, maintaining appropriate program oversight and quality assurance, and communicating data to a variety of audiences. Another issue that had to be addressed is how to satisfy the often competing interests and expectations of various stakeholders, including DEQ management and staff, politicians, interest groups, and the general public. This presentation will discuss how the DEQ has addressed these challenges, some lessons learned, and suggestions for others who may have to deal with similar issues.

Introduction

Environmental monitoring is an essential component of the Michigan Department of Environmental Quality (MDEQ) mission. Comprehensive water quality monitoring is necessary to improve natural resource management, maintain sustainable ecosystems, and protect public health. Assessment of the environmental impacts of point and nonpoint source discharges, the latter being diverse and more difficult to measure, is critical. Because bioaccumulative chemicals such as dioxins, PCBs, and mercury can have serious impacts on aquatic systems when present at extremely low concentrations, monitoring techniques must be sophisticated and sensitive. Therefore, water quality monitoring must effectively address changing environmental conditions and issues.

Because of a MDEQ commitment and a legislative mandate to develop a monitoring plan, a report titled "A Strategic Environmental Quality Monitoring Program for Michigan's Surface Waters" (Monitoring Strategy), was completed in January 1997. This Monitoring Strategy, prepared by the Surface Water Quality Division (SWQD) and the Land and Water Management Division (LWMD), describes the necessary monitoring activities for a comprehensive assessment of water quality in Michigan's surface waters. It consists of nine interrelated elements: fish contaminants, water chemistry, sediment chemistry, biological integrity, wildlife contaminants, bathing beaches, inland lake quality and eutrophication, stream flow, and volunteer monitoring. The Monitoring Strategy specifically identifies four goals:

- Assess the current status and condition of state waters and determine whether water quality standards are being met;
- Measure spatial and temporal water quality trends;
- Evaluate the effectiveness of water quality prevention and protection programs; and
- Identify new and emerging water quality problems.

In November 1998, Michigan citizens approved the Clean Michigan Initiative (CMI), a $675 million bond to clean up, protect, and enhance Michigan's environmental quality, natural resources, and infrastructure. Some of this money, specifically from the Clean Water Fund portion of the CMI, was allocated for the implementation of the activities outlined in the Monitoring Strategy, resulting in an increase of approximately $3 million per year for surface water quality monitoring. The process of implementing many new and expanded projects has been a challenge. The MDEQ has worked through a number of planning and logistical issues, such as meeting Monitoring Strategy commitments, balancing multiple monitoring goals, working through the political process inherent in a state bond initiative, and ensuring effective project management and oversight. This paper describes some of the major challenges that MDEQ has had to address and identifies key lessons from this effort.

Challenges and Key Lessons

Monitoring Strategy Constraints and Commitments

Without a written document providing a framework for a comprehensive water quality monitoring plan, it is unlikely that the MDEQ would have received additional monitoring funds through the CMI. In the enabling legislation, the governor and state legislature specifically stated that the implementation of the Monitoring Strategy was the first priority for funding under the Clean Water Fund portion of the CMI. However, there are some challenges associated with implementing a defined monitoring plan.

Because the plan identifies specific monitoring activities and associated cost estimates, flexibility to modify the study design and funding allocations among projects is limited. The MDEQ is somewhat constrained to follow the Monitoring Strategy as it is written. In some cases, relatively minor sampling and funding modifications seem warranted based on new data. However, if substantial modifications are made, the MDEQ could be criticized for not implementing the Monitoring Strategy as it was presented to Michigan citizens prior to voting on the CMI bond. Such constraints also make it more difficult to respond to emerging chemicals/issues and unplanned events that were not anticipated when the Monitoring Strategy was written.

To deal with such challenges in the development of a long-term Monitoring Strategy, a balance between specifics and generalities is necessary. Wording is important. For example, instead of identifying specific waterbodies and the exact parameters to be assessed, we recommend stating that "approximately 20 waterbodies will be assessed for selected nutrients, conventional parameters, metals, and organic contaminants." This provides enough specificity so that the intended audience (agencies, politicians, and/or public) understands the commitment, but still leaves flexibility. Then, prior to each field season, specific waterbodies and parameters can be identified based on the most recent data. We also recommend setting aside some money specifically to address unforeseen, emerging chemicals or issues. Although identifying emerging problems is one of the goals of our Monitoring Strategy, funds were allocated to each element (fish contaminants, water, sediment, etc.) with the idea that emerging issues would be addressed in each element. Although we have been able to respond to some emerging issues (e.g. MTBE, PBDEs, and perfluorooctane sulfonate), this approach has somewhat limited flexibility.

In 1999, the Governor established the Michigan Water Quality Monitoring Advisory Board (Board) to advise the MDEQ on issues affecting the implementation of the Monitoring Strategy, including statistical design, sampling and analytical methods, data management, and reporting. The Board consists of 5 individuals with expertise in water quality monitoring. Current members include representatives from the private sector, academia, local government, and a conservation organization. Meetings are held approximately three times per year. One benefit to working with the Board is that they have a good grasp of monitoring concepts and issues, and therefore can provide independent support for deviating from the Monitoring Strategy where appropriate. This support helps to deflect criticisms that the MDEQ is "not doing what it said it would", and provides a measure of flexibility.

Another concern is the effect of inflation over several years. The Monitoring Strategy required an additional $3.2 million per year for full implementation, based on equipment, personnel, and analytical costs in 1997. It is not likely that $3.2 million will buy the same monitoring program in 1997 as in 2007. Although the potential effects were understood, inflation was not specifically addressed in the Monitoring Strategy. The approach that MDEQ has taken to deal with inflation is to review the data each year, in cooperation with our partners, and find opportunities to streamline sampling and analysis. Another approach would be to estimate costs based on current prices and build in slight increases (perhaps 2%) each year to account for inflation. While costs have risen slightly since 1997, it has not yet substantially constrained our monitoring activities. It remains to be seen whether this will become more of a problem in future years.

Multiple Goals and Expectations

The Monitoring Strategy identified four monitoring goals (listed above). These goals provide the framework under which all of the MDEQ's water quality monitoring activities are conducted. In addition, each monitoring activity is designed to answer one or more management questions that were specified for each goal. While goals and management questions serve to focus efforts, one challenge which arises each year is how to balance the allocation of resources (staff and money) to ensure that these goals and management questions are adequately addressed. The Monitoring Strategy provides some guidance, but does not fully address this issue. The allocation process is made more difficult by competing interests both within MDEQ and among other partner agencies (federal, state, tribal, and local). One example of competing interests is the amount of resources devoted to statewide (usually trend) monitoring versus problem-specific issues at the local level. Another challenge is unrealistic expectations, i.e. that because the Monitoring Strategy is fully funded, we should have data on every parameter from every location. It simply is not possible to respond efficiently to every concern that is raised in the media, although we do attempt to address the most important issues. To respond to these challenges, the MDEQ has tried to balance statewide trend/issue monitoring and local, targeted activities. The end result is a mix of fixed stations that are routinely visited each year, and sites that are visited on a rotating (5-year watershed cycle) or as-needed basis. It also highlights the importance of maintaining as much flexibility as possible, to ensure that monitoring activities can be modified as appropriate to meet changing needs and unexpected issues that may arise.

A related challenge to evaluating the effectiveness of state and/or local activities is concern about how the resulting data will be used. For example, much of MDEQ's monitoring effort is directed to assessing the effectiveness of nonpoint best management practices (BMPs). Demonstrating water quality improvements specifically due to a BMP can be difficult. In some cases, concern has been expressed that the monitoring will not be robust enough to detect water quality

improvements, and will undermine support for BMPs that would intuitively seem to be beneficial in many respects. Another problem is that evaluating program effectiveness can be difficult if a potential partner agency is uninterested in follow-up data. MDEQ devotes a considerable amount of time to measuring water quality improvements due to the Conservation Reserve and Enhancement Program (CREP), which provides incentives to farmers to install filter and buffer strips along stream margins. However, because of the way the program is structured, we often don't receive sufficient notification prior to implementation to obtain adequate baseline data at a site. Close links must be established with internal program staff as well as external agencies, and working with them on a regular basis to develop an effective sampling plan must be a priority. Internal and external program staff should be approached at the beginning of the study design process to solicit their input and support, rather than after the plan has been developed. This observation is an obvious one, but in practice such communication often fails to occur on a day-to-day basis. It takes genuine effort to establish and maintain good communication among programs and agencies, but such dialogue is necessary to ensure that monitoring activities are proactive rather than reactive.

Management and Oversight

Perhaps the major challenge to successful implementation of the Monitoring Strategy is project management and oversight. In addition to $3.2 million, the Monitoring Strategy requested 16 additional FTEs to initiate and carry out the identified water quality monitoring activities. However, the legislature stipulated that only 3% of CMI funds could go for state administrative costs (i.e. FTEs), resulting in only 3 new FTEs to implement the Monitoring Strategy. Therefore, many new partnerships have been formed, including federal, other state, and local entities, tribes, academia, and nonprofit organizations. Most of the activities are being implemented through grants and contracts, which has led to a substantial increase in contract management and oversight responsibilities for MDEQ staff. This is a challenge because contract management can be tedious and is not a favorite activity of most technical staff. Therefore, management and staff acceptance of this responsibility is critical. All staff must receive timely, adequate contract management training. Another side effect is that MDEQ staff are not as familiar with the technical aspects of a particular project they are overseeing as they would if they were actually doing the work themselves. This can make it more difficult to respond in a timely and satisfactory manner to questions and information requests.

Other difficulties with contracting projects to so many different entities include data and report consistency and timeliness of reports and progress reports. MDEQ has taken steps to deal with these challenges. One FTE is used to coordinate the implementation of the entire Monitoring Strategy. This staff person oversees all project managers, making sure that each grantee/contractor submits quarterly progress and financial status reports in a timely fashion. All projects are closely tracked, and information about the status and budget of any (or all) projects can be provided immediately. This same staff person also reviews drafts of all final reports to ensure consistency in content, data analysis, and format, to the extent possible. Approved quality assurance project plans are required for all monitoring activities prior to sample collection, and are included in the project file. Quarterly status reports on the implementation of the Monitoring Strategy are provided to management. These reports conclude with a section highlighting problems or difficulties that have arisen, which helps to prevent problems from falling through the cracks. Finally, report consistency and timeliness was a problem in the early stages of implementation, with so many different entities working on various projects. In some cases, MDEQ staff analyzed the data and wrote the first reports to ensure that our needs were met. This caused some delays in report preparation. However, the principal investigators will complete future reports with similar data analyses and formats, which will help with report consistency. All first year reports (1999) are now completed, second year reports (2000) will be completed in the next couple of months, and 2001 reports will soon follow.

Funding Issues

There are a number of issues related to funding that can present challenges to the implementation of water quality monitoring activities. The main challenge, of course, is obtaining sufficient, long-term funding. In 1995, the state legislature required that the MDEQ develop a monitoring plan. In 1998, after the Monitoring Strategy was completed, the Governor and legislature proposed the CMI bond, which specifically included funding for the implementation of the Monitoring Strategy. Each year since 2000, the legislature has appropriated CMI funds for monitoring, reaching $3

million in Fiscal Year 2002. This funding source has allowed the MDEQ to greatly expand and improve water quality monitoring activities. Without having a comprehensive plan for water quality monitoring when the CMI bond was being developed, it is very unlikely that any bond monies would have been allocated for monitoring.

The distribution of grants and contracts throughout the state also presents a challenge. There is an expectation that local entities should receive a healthy portion of the funding each year to address local concerns, rather than all funds being used to assess statewide trends and issues. We frequently receive requests for information about who is receiving grant and contract funds, as well as for the percentage of the total amount that is going to local organizations and governments. This requires MDEQ to ensure that grants and contracts are distributed throughout Michigan and means that an additional factor must be considered when evaluating grant proposals.

Another funding challenge is the timing of the annual appropriation. In 1998 (state general funds) and 2000 (CMI funds), the legislature did not complete the appropriation until June or July, well into the field season. Even after finalizing grants and contracts as quickly as possible, most of the field season had passed. As a result, there are substantial data gaps for those two years. We have responded to this challenge by signing long-term contracts where possible (instead of new contracts each year) and forward-funding most of these contracts by one year. Therefore, most of our current monitoring projects could continue well into, or through, 2003 with funds appropriated through fiscal year 2002. This has allowed us to achieve some continuity in monitoring without being held hostage to delayed appropriations every year.

Communication and Outreach

Another major challenge to implementing the Monitoring Strategy is communication and outreach, both in terms of explaining the monitoring activities and reporting the data to a variety of audiences. After receiving a large increase in funding, with few additional people, most of the staff effort focused on finalizing work plans, signing contracts, and initiating projects. Less effort was spent explaining to the public and other audiences (e.g. legislators, media, environmental organizations, private sector) what monitoring activities were being implemented, and why the activities were being done. The result is that MDEQ has, to some extent, been "playing catch up" on explaining our monitoring activities. We give frequent presentations to a variety of technical and lay audiences, and always accept offers to give presentations. A water quality monitoring web page, which will include project descriptions and reports, will be available by June, 2002. In addition, one full meeting with the Water Quality Monitoring Advisory Board (see above) was devoted to improving communication and outreach.

There often is pressure to respond to the "issue of the day", based on news media coverage. While some of these are in fact legitimate concerns which we would address regardless of media coverage, the effect can be to limit flexibility and make it more difficult to conduct a consistent, long-term monitoring program. To ensure that monitoring funds are spent efficiently, communication with legislators and the media is important. Periodic briefings with legislators and their aides can be used to explain goals, management questions, ongoing/planned activities, and present results. A couple of these meetings already have occurred, and we are trying to arrange additional ones. Media requests for information are fulfilled as quickly and completely as possible, and staff are available for interviews (which usually occur by phone). Through such contacts, MDEQ hopes to demonstrate that we have a comprehensive, coherent monitoring plan, and to minimize the potential for outside pressures to drive the implementation of this monitoring plan.

Integrating data and reporting results to many audiences is another challenge. Because most of the monitoring is performed by outside entities, ensuring consistent data analysis and reporting is difficult (discussed above). Project-specific reports are produced annually, and generally are geared to management and technical staff. Also, with so many projects underway in all media (water, sediments, fish/wildlife tissue, and biological/physical habitat), it is difficult to summarize this wealth of data into a coherent, statewide picture of water quality. The MDEQ and the Michigan Department of Natural Resources produce an annual "State of Michigan's Environment" report, which includes environmental indicators from water, air, and land. This report is non-technical and is meant for the general public. A more detailed report specifically integrating the water quality data will be prepared later in 2002, and will be targeted primarily to a non-technical audience. The objective of

such a report is to help to build and maintain public and political support for long-term water quality monitoring. Access to various reports will improve with the completion of the water quality monitoring web page.

Conclusion

The MDEQ has been extremely fortunate to receive and maintain a significant ($3 million per year), dedicated source of funding through the CMI for water quality monitoring. The completion of a Monitoring Strategy in 1997 was a major reason that such funding was appropriated by the legislature. The result is a substantial improvement in, and expansion of, water quality monitoring in Michigan. However, the MDEQ has had to address some challenges during the implementation of the Monitoring Strategy. These include Monitoring Strategy constraints and commitments, multiple goals and unrealistic expectations, funding issues, project management and oversight, and communication and outreach. None of these potential problems are intractable, however, and can be addressed through good planning and effective management and oversight. This paper explains some of the major challenges and provides suggestions on dealing with them. The MDEQ's experience with this process, and the lessons learned, can benefit other federal, state, tribal, and local agencies that are in a position to develop a monitoring plan and to initiate new and expanded monitoring activities in the future.